

# The Pan-Pacific Entomologist

VOL. IX, No. 2

April, 1933

## NOTE ON THE RELATIONSHIP OF AN ICHNEUMONID TO CERTAIN DIGGER WASPS

BY CHARLES H. HICKS

*University of Colorado, Boulder, Colorado*

The digger wasps,<sup>1</sup> *Podalonia violaceipennis* (Lep.) and *Sphex xanthopterus* (Cam.), have been found fairly common nesting in the sand of the Los Angeles River. The nesting females have been studied in the field, their prey with attached egg secured, brought to the laboratory and development witnessed. In this way certain parasites and other insects, affecting the young of these wasps, have been reared. Among these is a large ichneumonid, *Paniscus* sp.,<sup>2</sup> which ravages the food of the wasp larva and later kills it.

The prey of *P. violaceipennis* and *S. xanthopterus* among others, consists of *Zale lunata* (Drury<sup>3</sup>) and its varieties and *Homoptera salicis* Behr, the latter species having been determined by the late Dr. William Barnes. It is with *Z. lunata*, however, that this paper more specifically deals.

The first record of *Paniscus*, obtained by the author, was secured from a nest of *P. violaceipennis* on August 11th, several years ago at Universal City, California. The wasp egg was broken while transporting it and later perished. Little attention was given to the prey until August 18th when a large, nearly mature, larva had almost finished eating it. On the morning of the 19th this larva, to all appearances, had finished a cocoon which differed in many ways from that formed by the larva of the wasp, *P. violaceipennis*. Thick black strands held suspended in the center of the vial measuring 14 mm. in diameter, a nearly black cocoon. This cocoon measured 16 mm. in length, 6 mm. in diameter through the center and about 5 mm. at either end. An adult ichneumonid, a *Paniscus*, possibly *semirufus*, emerged

<sup>1</sup> Wasps referred to in this paper have been determined by Professor H. T. Fernald.

<sup>2</sup> Determined by Mr. R. A. Cushman, as *Paniscus* sp. or possibly *P. semirufus* Hgn.

<sup>3</sup> Determined by Dr. John A. Comstock.

from the cocoon on September 4th by cutting a circular cap off the anterior end.

On September 7th another nest was taken, the wasp egg of which was broken before it had time to hatch. By September 12th a small larva was found feeding from the prey between the first and second pairs of true legs. At this time it was light in color and very small, measuring barely 1.5 mm. in length. It continued feeding and grew rather rapidly. By September 17th, it had increased in size until it was 17 mm. in length and nearly 7 mm. through the widest part of its body. By this time it had eaten almost all of the prey and was nearly full-grown. This larva was able to re-attach itself, if removed from its prey, and did so under observation. It fed, however, for the most part continuously from the same spot.

The morning of September 18th found the larva with its food devoured, its body pale green in color and its activity rather feeble. During the afternoon of the same day it began a framework of fibers for its cocoon. These were light at first but soon became darker and finally almost black. By evening an outline of the cocoon had been formed and by the next morning a typical cocoon of this species was almost, if not entirely, finished.

The question early arose as to what would happen to the young of the wasp if the egg had not been broken and its larva had lived to come in contact with that of the ichneumonid. The opportunity of learning this soon presented itself for the prey of *P. violaceipennis*, from a nest taken later, soon held a small parasite between its fore legs and the small wasp larva on an abdominal segment. Each continued to feed in its respective position until approximately half-grown, when the food supply gave out. The ichneumonid larva soon attacked the waspling and devoured it. The feeding over, the surviving larva then spun a cocoon, pupated and later emerged a mature insect.

It was noted at the time of emergence that a large mass of material remained in the cocoon. This was compact, light yellow and rather stiff in consistency. It was probably fecal matter, together with larval and pupal skins. It was again noted in the spring of 1932 under somewhat different circumstances. At this time rodents in burrowing in the banks of the Los Angeles River unearthed several cocoons of *Paniscus*. These exposed to

the sun were conspicuous on the mounds. Several were secured, each of which, with one exception, when opened contained a dead larva. This one held a live pupa, which was apparently entirely surrounded with a liquid. The pupa, exposed and removed from the cocoon and liquid, soon died. It is a question if this substance held any important place under these conditions in the life of the insect.

The ichneumonid was reared also while studying the habits of *S. xanthopterus* using like prey. The interesting but serious relationship, in so far as the young of the wasp and the moth is concerned, was again observed. The nest and prey, with the egg of *S. xanthopterus*, were taken late on the afternoon of October 8, 1927, at Los Angeles, California. By October 11th the wasp's egg had already hatched and this larva was feeding from the moth larva. Soon a small larva was found between the first pair of true legs of the prey.

Each continued to feed without leaving its respective position for three days more, during which time the ichneumonid grew faster than did the wasp larva. On the evening of October 14th, the ichneumonid left its original feeding place at the anterior part of the body, moved back and attacked the living wasp larva. Its head soon became attached to the side, near the center of the body, while the attacked wasp larva still held onto its prey.

The following morning nothing but a limp skin of the wasp larva remained, the head still at its first position on the fourth abdominal segment. The ichneumonid was feeding again, at this time on the remains of the moth larva, the original prey. By mid afternoon almost all of the moth larva had been eaten with the exception of the skin and the hard parts of the head and legs. By evening the parasite had spun a few strands for its cocoon, which by morning had been increased and supplemented by an apparently complete cocoon of the insect.

It would be interesting to learn whether or not the wasp larva ever destroys the larva of *Paniscus* under the conditions as outlined above. As far as my observations go, the wasp larva has always been destroyed and devoured by the ichneumonid. The number of wasps destroyed each season must be great and the ichneumonid must constitute a serious menace to its increase in numbers.

Cushman<sup>4</sup>, in an excellent and interesting account of some types of parasitism among the ichneumonidæ, reviews a number of records of habits in certain species of the genus *Paniscus*. This paper considers parasite and host relationships, the egg of *Paniscus* and its development, growth and change in the larva and other pertinent and important points.

The host, in the instances recorded, has always been a lepidopterous larva. He states (p. 40) that: "In *Paniscus* and very likely in all the parasites of this type the attack of the parasite is made on nearly or quite full-grown larvæ, which thereafter burrow into the ground (presumably,) or some other medium for pupation."

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EDGAR A. DODGE

It is with sincere regret that we chronicle the passing of our friend, Mr. E. A. Dodge of Santa Cruz, California, at the ripe age of nearly eighty years. Through all his long life he was actively interested in the study of the North American Lepidoptera. During his earlier years he collected at or near his home at Louisiana, Missouri in collaboration with his brother, G. M. Dodge. Together they became interested in the genus *Catocala* and accumulated a very complete series of the American species of those beautiful moths. With his brother he also became much interested in the Hesperidæ or "skippers" and in time secured a fairly complete series of the North American species.

Mr. Dodge's removal to Santa Cruz about 1909 did not lessen his interest in the Lepidoptera and in his later years, in collaboration with Mr. John Strohbeen, he turned his attention to the collection of the butterflies and moths of Santa Cruz County, in which work he was actively engaged up to the time of his death. His collection, including the valuable material taken during his early life in the middle west, he left to the California Academy of Sciences, to whose collection of insects it will make a most valued addition.—E. P. Van Duzee.

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<sup>4</sup> Cushman, R. A. Some Types of Parasitism Among the Ichneumonidæ. Proc. Ent. Soc. Wash., Vol. 28, pp. 38-40, 1926.